PATENT ABSTRACTS OF JAPAN

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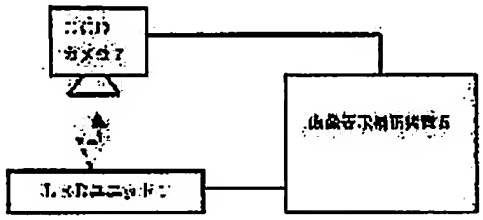
(54) CORRECTING SYSTEM AND METHOD FOR IMAGE DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an image display device correcting system which efficiently conducts corrections such as white balance and screen luminance correction and to provide a correction method of an image display device.
SOLUTION: The correction system consists of an image reading device 7 which has two dimensional photodetectors that are capable of discriminating luminance of a display section 1 for every small pixel and an image display correcting device 5 which supplies prescribed image data and sets driving currents. The device 5 has an operating filter storage section which supplies the prescribed image data to a reference image display device, drives the device, reads the luminance of the image read by the device 7 for every pixel and stores an operating filter that makes the luminance becomes a prescribed value, a luminance data storage section which supplies the data to the image display device to be corrected, drives the device, reads the luminance of the image read by the device 7 through the operating filter and stores the average value of the computed luminance and a luminance control section which sets a driving current for every color tone based on the difference between the average value of the stored luminance and the prescribed value so that the average value of the luminance approaches the prescribed value.



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CLAIMS

[Claim(s)]
[Claim 1] It is the image-display-device amendment system which amends the display of the image display device with which the light emitting device of two or more color tones consists of a display arranged for every pixel, and a mechanical component which supplies a drive current to said each light emitting device based on image data. The image reader with which said image-display-device amendment system has for brightness the two-dimensional photo detector which can be distinguished for every pixel at least to the whole surface of said display, It consists of image display compensators which supply predetermined image data to said image display device, and set up the drive current in said mechanical component. Further said image display compensator The image display device made into criteria is made to supply and drive said predetermined image data. The operation filter storage section which reads the brightness of the image read by the image reader for every pixel, and memorizes an operation filter with which each read brightness becomes a predetermined value, The brightness data storage section which the image display device which should be amended is made to supply and drive said predetermined image data, reads the brightness of the image read by the image reader through said operation filter, and memorizes the average value of the computed brightness, So that the average of the brightness of the image display device which should be amended based on the difference of the average of the brightness memorized in said brightness data storage section and said predetermined value may approach said predetermined value The image-display-device amendment system characterized by having the brightness control section which sets up the drive current over each light emitting device supplied from said mechanical component for every color tone.
[Claim 2] Said brightness data storage section memorizes further the brightness read through said operation filter for every light emitting device. Said brightness control section So that the brightness of each light emitting device in the image display device which should be amended may approach said predetermined value based on the difference of the brightness for every pixel memorized in said brightness data storage section, and said predetermined value The image-display-device amendment system according to claim 1 characterized by setting up the drive current over each light emitting device supplied from said mechanical component for every light emitting device.
[Claim 3] The display of the image display device with which the light emitting device of two or more color tones consists of a display arranged for every pixel, and a mechanical component which supplies a drive current to said each light emitting device based on image data It is the amendment approach of the image display device which amends brightness using the image reader which has the two-dimensional photo detector which can be distinguished for every pixel at least to the whole surface of said display. Make the image display device made into criteria supply and drive predetermined image data, and the brightness of the image read by the image reader is read for every light emitting device. The operation filter creation process which creates an operation filter with which each read brightness becomes a predetermined value, The average luminance reading process of making the image display device which should be amended supplying and driving said predetermined image data, reading the brightness of the image read by the image reader through an operation filter, and memorizing the average of the computed brightness, So that the average of the brightness of the image display device which should be amended based on the difference of the average of the brightness memorized in said brightness reading process and said predetermined value may approach said predetermined value The amendment approach of the image display device characterized by consisting of an average luminance setting process of setting up the drive current over each light emitting device supplied from said mechanical component for every color tone.
[Claim 4] The dot brightness reading process of memorizing the brightness which read the amendment approach of said image display device through the operation filter for every light emitting device, So that the brightness of each light emitting device in the image display device which should be amended may approach said predetermined value based on the difference of the brightness for every light emitting device memorized in said

dot brightness reading process, and said predetermined value The amendment approach of the image display device according to claim 3 characterized by performing the dot brightness setting process of setting up the drive current over each light emitting device supplied from said mechanical component for every light emitting device, before said average luminance setting process.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the amendment approach of of the image-display-device amendment system and image display device with which the light emitting device of two or more color tones equipped the detail with the function which amends the amount of luminescence according to property dispersion of a light emitting device about the image display device arranged for every pixel.
[0002]
[Description of the Prior Art] light emitting devices of high brightness, such as today and light emitting diode (LED), — RGB — it is each developed and a large-sized spontaneous light type full color display is produced. Especially, a LED display has the descriptions, like a light weight and thin-shape-izing are possible, and power consumption is low, and, also outdoors, need is increasing it rapidly as an usable large-sized display.
[0003] In the case of a large-sized LED display which is installed in the outdoors, it is constituted by generally combining two or more LED units, the image corresponding to the image field specified among the divided image fields is displayed on each LED unit, and all image fields are displayed on the whole LED display. The light emitting diode which makes RGB a lot on a substrate is arranged in the shape of a pixel matrix, and each LED unit performs the same actuation as an above-mentioned LED display to an LED unit. In a large-sized LED display with big size, a total of no less than 120,000 pixels LED beside [400] vertical 300x is used, for example.

[0004] Generally as a drive method of an LED unit, the dynamic drive method is used. For example, in the case of the LED display constituted in the shape of [of a m line n train] a matrix, the anode terminal of LED located in each line is connected common to one common source line, and the cathode terminal of LED located in each train is connected common to one current Rhine. Sequential ON of the common source line whose m lines are is carried out with a predetermined period, and a drive current is supplied to n ****** current Rhine according to the image data corresponding to turned-on Rhine. The drive current according to the image data is impressed to LED of each pixel by this, and an image is displayed.
[0005] In order to reproduce image data on a LED display correctly, it is needed that the optical output property (drive current-brightness property) of each LED is uniform. However, although LED is formed on a wafer of semiconductor technology, dispersion in an optical output property arises with a manufacture lot, a wafer, or a chip. For this reason, dispersion arose in a white balance or average luminance for every LED unit, and there was a problem that the discontinuity of an image was sensed for people's eyes in the boundary part of an LED unit. For this reason, a predetermined white balance and predetermined field brightness needed to be set up beforehand, the magnitude of the drive current corresponding to image data needed to be amended according to dispersion in the LED optical output property of each pixel of each LED unit, and the LED unit needed to be amended.
[0006] Then, amendment of the conventional image display device was performed as follows.
[0007] The monochrome luminescence display of each image data about a predetermined image, for example, RGB, and the white display by coincidence luminescence are read into an LED unit with brightness chromoscope, and it is set up so that a white balance and field brightness (average of brightness) may become a predetermined value. In brightness chromoscope, although the brightness and chromaticity as the field average of the whole LED unit are obtained correctly, it cannot obtain about the brightness in every pixel, and a chromaticity. Therefore, brightness dispersion for every pixel is amended by using photosensor and obtaining the relative luminance of each LED correctly for every pixel separately, next. According to this process, the LED unit by which a white balance, field brightness, and pixel brightness dispersion were amended can be obtained.
[Problem(s) to be Solved by the Invention] However, while amendment of the image display device by

brightness chromoscope and photosensor could perform a white balance and field brightness amendment correctly, it had the trouble that amendment of an image display device took time amount. Then, this invention aims at offering the amendment approach of of the image-display-device amendment system and image display device which can amend image display devices, such as a white balance and field brightness amendment, efficiently, without causing the rise of production-line cost.
[0008]
[Means for Solving the Problem] The display by which, as for the image-display-device amendment system of this invention, the light emitting device of two or more color tones has been arranged for every pixel, It is the image-display-device amendment system which amends the display of the image display device which consists of a mechanical component which supplies a drive current to said each light emitting device based on image data. The image reader with which said image-display-device amendment system has for brightness the two-dimensional photo detector which can be distinguished for every pixel at least to the whole surface of said display, It consists of image display compensators which supply predetermined image data to said image display device, and set up the drive current in said mechanical component. Further said image display compensator The image display device made into criteria is made to supply and drive said predetermined image data. The operation filter storage section which reads the brightness of the image read by the image reader for every pixel, and memorizes an operation filter with which each read brightness becomes a predetermined value, The brightness data storage section which the image display device which should be amended is made to supply and drive said predetermined image data, reads the brightness of the image read by the image reader through said operation filter, and memorizes the average value of the computed brightness, So that the average of the brightness of the image display device which should be amended based on the difference of the average of the brightness memorized in said brightness data storage section and said predetermined value may approach said predetermined value It considers as the configuration which has the brightness control section which sets up the drive current over each light emitting device supplied from said mechanical component for every color tone.

[0009] By this, the image-display-device amendment system which can amend image display devices, such as a white balance and field brightness amendment, efficiently can be offered.
[0010] The image-display-device amendment system of this invention furthermore, said brightness data storage section Further Said brightness data storage section memorizes further the brightness read through said operation filter for every light emitting device. Said brightness control section So that the brightness of each light emitting device in the image display device which should be amended may approach said predetermined value based on the difference of the brightness for every pixel memorized in said brightness data storage section, and said predetermined value By considering as the configuration which sets up the drive current over each light emitting device supplied from said mechanical component for every light emitting device, it can amend efficiently also about pixel brightness dispersion.
[0011] Moreover, the display by which, as for the amendment approach of the image display device of this invention, the light emitting device of two or more color tones has been arranged for every pixel, The display of the image display device which consists of a mechanical component which supplies a drive current to said each light emitting device based on image data It is the amendment approach of the image display device which amends brightness using the image reader which has the two-dimensional photo detector which can be distinguished for every pixel at least to the whole surface of said display. Make the image display device made into criteria supply and drive predetermined image data, and the brightness of the image read by the image reader is read for every light emitting device. The operation filter creation process which creates an operation filter with which each read brightness becomes a predetermined value, The average luminance reading process of making the image display device which should be amended supplying and driving said predetermined image data, reading the brightness of the image read by the image reader through an operation filter, and memorizing the average of the computed brightness, So that the average of the brightness of the image display device which should be amended based on the difference of the average of the brightness memorized in said brightness reading process and said predetermined value may approach said predetermined value It considers as the configuration which consists of an average luminance setting process of setting up the drive current over each light emitting device supplied from said mechanical component for every color tone.
[0012] By this, the amendment approach of the image display device which can amend image display devices, such as a white balance and field brightness amendment, efficiently can be offered.
[0013] Furthermore, the amendment approach of the image display device of this invention The dot brightness reading process of memorizing the brightness which read the amendment approach of said image display device through the operation filter for every light emitting device, So that the brightness of each light emitting device in the image display device which should be amended may approach said predetermined value based on the

difference of the brightness for every light emitting device memorized in said dot brightness reading process, and said predetermined value By considering the dot brightness setting process of setting up the drive current over each light emitting device supplied from said mechanical component for every light emitting device as the configuration performed before said average luminance setting process Since it can amend efficiently also about pixel brightness dispersion and field brightness amendment is performed after amendment of pixel brightness dispersion, a white balance can be amended good.

[0014]

[Embodiment of the Invention] The schematic diagram of the image-display-device amendment system in this invention is shown in drawing 1 . 1 shows the LED unit which is an example of the image display device which displays the image corresponding to the image field specified among the divided image fields. The LED unit 1 is connected to the image display compensator 5. The image display compensator 5 displays a predetermined image on the LED unit 1, and reads the brightness of LED at that time with CCD camera 7 which is the image reader which has the two-dimensional photo detector which can distinguish brightness for every pixel [at least] to the whole surface of the LED unit 1. It is CCD camera 7 which is the image reader which has the two-dimensional photo detector which can distinguish brightness for every pixel [at least], and is because brightness can be measured for every light emitting device by making a light emitting device drive for every color tone by reading the image display of the LED unit 1. The light of the display image from the LED unit 1 is inputted into each CCD component through the visibility filter which is an optical filter attached in CCD camera 7. A visibility filter is attached in order to amend the gap with the sensibility property of a CCD camera and human being's visibility property in a light field. Furthermore, the image display compensator 5 compares the brightness data and the predetermined value about the brightness read by CCD camera 7, and amends the display of the LED unit 1 based on the comparison result.

[0015] The rough block diagram of the LED unit 1 is shown in drawing 2 . 11 is the display 11 which displays the image corresponding to the image field specified among the divided image fields. 1 pixel is constituted combining each LED of RGB corresponding to three color tones as a picture element (dot), two or more pixels are arranged in the shape of [of a m line n train] a matrix, and a display 11 is constituted.

[0016] The amendment data which need the amendment data storage section 32 for the brightness of a display 11 and amendment of a white balance are memorized. As the amendment data storage section 32, EEPROM is used, for example. The white balance amendment data and field brightness amendment data required for the amendment data storage section 32 in order to control the predetermined amount of currents supplied for every color tone in the current feed zone 14 which are data, and dot brightness amendment data required in order to amend brightness for every light emitting device in the brightness amendment section 13 are memorized. Amendment data are set up from the image display compensator 5 through the communications department 33.

[0017] The amendment data control section 31 writes amendment data required for amendment in the current feed zone 14 and the brightness amendment section 13, respectively. The inputted image data is inputted into the drive time amount control section 12 through the image input section 19 from the outside. The current of the amount of currents amended by the brightness amendment section 13 is supplied to the drive time amount control section 12, drive time amount is controlled by pulse width based on image data for the supplied current, and it inputs into a display 11 as a pulse drive current. At this time, the drive time amount control section 12 may be controlled not by pulse width but by the count of a drive of a fixed pulse etc.

[0018] The address-generation section 18 generates the address which shows the line corresponding to Vertical Synchronizing signal Vs and Horizontal Synchronizing signal Hs which were inputted, and inputs it into the common driver 17. The common driver 17 drives the line corresponding to the inputted address. Moreover, the drive time amount control section 12 serves as the segment driver, combines with the common driver 17, drives [the train corresponding to Horizontal Synchronizing signal Vs is driven, and] one pixel to time sharing, and realizes a matrix display.

[0019] Next, the brightness of a display 11 and amendment of a white balance are explained. In the current feed zone 14, the current supplied from the current feed zone 14 is amended for every RGB based on the white balance amendment data and field brightness amendment data which were memorized by the amendment data storage section 32. Thus, the white balance and field brightness of the LED unit 1 whole are amended, and dispersion for every LED unit is prevented.

[0020] In the brightness amendment section 13, the drive current supplied to each LED is amended for every LED child based on the dot brightness amendment data memorized by the amendment data storage section 32 for every light emitting device. Thus, the brightness of each LED is adjusted and dispersion in the brightness for every light emitting device in the same LED unit 1 is prevented.

[0021] Therefore, it becomes possible to prevent dispersion not only in the brightness for every LED unit, and

dispersion of a white balance but the brightness for every pixel in the same LED unit.
[0022] moreover, the brightness amendment section 13 after the drive current first supplied to each LED corresponding to the color tone of each RGB based on white balance amendment data and field brightness amendment data was amended in the current feed zone 14 — setting — each of each pixel — amendment becomes possible by amending a drive current according to an individual for each [, such as white balance amendment, field brightness amendment, and dot brightness amendment,] element of every.
[0023] Next, the schematic diagram of the image display compensator 5 is shown in drawing 3 . The electrical signal about the brightness read by CCD camera 7 is changed into the digital signal of 0-255 in the brightness input section 52. In an operation filter creation process, the changed digital signal creates an operation filter with which each brightness read in the CCD proofreading section 53 becomes a predetermined value, and memorizes it in the operation filter storage section in the CCD proofreading section 53. Moreover, in a dot brightness reading process and an average luminance reading process, the CCD proofreading section 53 amends the changed digital signal using an operation filter, and inputs the amended brightness data into the brightness control section 51. The brightness control section 51 computes the average value of brightness data to the inputted brightness data, and makes the brightness data storage section 54 memorize the average value of brightness data and the brightness data for every light emitting device which were computed.
[0024] furthermore, the thing for which the field brightness amendment data in the amendment data storage section 32 of the LED unit 1 are set up for every color tone through the communications department 56 in the brightness control section 51 based on the difference of the average of brightness data and the predetermined value which were memorized in the brightness data storage section so that the average of brightness may approach a predetermined value — a drive current is controlled. Control of a drive current is controllable by the amount of currents or drive time amount to supply. moreover, the thing for which the brightness control section 51 sets up the dot brightness amendment data in the amendment data storage section 32 of the LED unit 1 for every pixel of each LED through the communications department 56 based on the difference of the brightness data for every LED memorized in the brightness data storage section, and said predetermined value so that the brightness of each LED may approach a predetermined value — a drive current is controlled. The predetermined image data supplied to the LED unit 1 is outputted to the LED unit 1 through the image output section 55.
[0025] In this invention, dispersion of the orientation property of an LED proper and sensibility dispersion of the CCD component 72 can be amended by creating an operation filter based on a criteria unit in an operation filter creation process. Thus, by creating an operation filter and reading image data, a highly precise current-brightness property is acquirable.
[0026] The display amendment approach of the LED unit 1 is explained below.
[0027] First, a criteria LED unit required for proofreading of CCD camera 7 is created. Through the image input section 19, the image data about a predetermined image is inputted into a criteria LED unit, the display image is read into it with brightness chromoscope, and white balance amendment data and field brightness amendment data are set up by the amendment data storage section 32, respectively, and are remembered that a white balance and field brightness become a predetermined value. In this brightness chromoscope, although the brightness and white balance to the whole surface of the LED unit 1 can measure correctly, it cannot measure about the brightness about each LED. Then, the relative luminance of each LED is correctly measured using photosensor. And it makes it set up and remember that the dot brightness amendment data of the amendment data storage section 32 in the LED unit 1 amend dispersion in the brightness of each pixel, and the criteria LED unit by which a white balance, field brightness, and dot brightness dispersion were amended correctly is obtained.
[0028] As image data about a predetermined image, all LED drive displays for every RGB by the maximum of the image data of each RGB and all white displays [LED drive] by the maximum of the image data of RGB are mentioned, for example. The drive current supplied to each RGB so that it may become a predetermined color temperature and the predetermined field average luminance corresponding to the maximum of the image data of RGB about these images is set up.
[0029] Next, based on the criteria unit correctly adjusted using brightness chromoscope and photosensor, LED unit display amendment processing in which display amendment of each LED unit is performed is explained using the flow chart of drawing 4 .
[0030] At the criteria unit reading process S1, a criteria unit is arranged so that the display image can be read with CCD camera 7, and it connects with the image display compensator 5. And the image display compensator 5 inputs the image data about a predetermined image into a criteria unit through the image input section 19, and the brightness data which correspond for every LED in the condition that the setup of an operation filter is not made by the CCD proofreading section 53 are read through CCD camera 7. And in the operation filter creation

process S2, the image display compensator 5 creates an operation filter so that it may become the predetermined value with which the image data of each read LED is regarded as a criteria white balance and datum-level brightness having been set up, and it sets it as the CCD proofreading section 53. As a predetermined value, the average of each brightness corresponding to all LED drive displays for every RGB by the maximum of the image data of each RGB is mentioned, for example. Correction by sensitiveness of CCD camera 7 to the display light from an LED unit is performed by this processing. Sensibility dispersion of each CCD camera 7 can be performed using a common criteria unit at the time of the mass production of an LED unit which installs two or more CCD cameras 7, and performs display amendment of the LED unit 1 especially, and display dispersion of the LED unit 1 resulting from sensibility dispersion of CCD camera 7 can be prevented.

[0031] Next, in the LED unit brightness reading process S3, the LED unit 1 to which amendment of a white balance and field brightness is not performed is arranged so that the display image can be read with CCD camera 7, and it connects with the image display compensator 5. Like the criteria unit reading process S1, the image display compensator 5 inputs the image data about a predetermined image into the LED unit 1 through the image input section 19, and reads and memorizes the brightness data amended by the CCD proofreading section 53 in the condition that CCD camera 7 and the operation filter were set up for every LED. The average of the brightness about the whole LED unit of the read brightness data corresponding to it and coincidence is computed and memorized for every LED. The LED unit brightness reading process S3 includes the pixel brightness reading process of reading and memorizing this brightness data for every LED, and the average luminance reading process which computes the average of the brightness about the whole LED unit, and is memorized.

[0032] Next, in current-brightness property acquisition process S4, the drive current supplied to each LED is changed by setting up the dot brightness amendment data of the amendment data storage section 31 of the LED unit 1 interior, and the current-brightness property of each LED is acquired.

[0033] Here, the processing in current-brightness property acquisition process S4 is explained using the flow chart of drawing 5 . First, in step S41, LED of each pixel is all displayed for every RGB, each brightness data is read for every LED, and the average of the brightness of the LED unit 1 whole is computed for every RGB. Next, in step S42, the brightness data of LED of each RGB of each pixel are compared with the average value of the brightness of each RGB, when the brightness data of LED are larger, it shifts to step S43, and when the brightness data of LED are smaller, it shifts to step S44. In step S43, the minimum value of dot brightness amendment data is set up and memorized by the amendment data storage section 32 in the LED unit 1. Moreover, the maximum of dot brightness amendment data is set up and memorized in step S44 by the amendment data storage section 32 in the LED unit 1. Next, in step S45, it judges whether the comparison with the image data of LED and the average of brightness was performed about all pixels and RGB, when all are performed, processing S4 is ended, and when all are not performed, return and the same processing are performed to step S42 about other pixels and other color tones.

[0034] Next, in the pixel brightness setting process S5, in step S51, a predetermined image is first displayed based on the dot brightness amendment data with which the LED unit 1 was set as the amendment data storage section 32, and the brightness data of each pixel are acquired for every RGB. Next, the dot brightness amendment data which computed dot brightness amendment data based on the difference of the brightness data for every RGB of each pixel and the average value of the brightness of each RGB which were acquired in step S51 so that the brightness data of LED of each RGB of each pixel might become the average value of the brightness of each RGB, and were computed in the amendment data storage section 32 in the LED unit 1 are made to set up and memorize in step S52. Next, in step S53, a predetermined image is displayed based on the dot brightness amendment data with which the LED unit 1 was set as the amendment data storage section 32, and the brightness data of each LED are acquired for every RGB. Next, in step S54, the difference of the brightness data of LED of each RGB of each pixel and the average of the brightness of each RGB is computed, and the difference of each RGB of all pixels judges whether it is the inside of tolerance. When all those differences judge it as the inside of tolerance, the pixel brightness setting process S5 is ended. When it judges that all those differences are not in tolerance, it shifts to step S55. In step S55, it judges whether reprocessing of processing of current-brightness property acquisition process S4 was performed. When it judges that reprocessing was performed, it shifts to step S56, abnormalities are displayed, and the pixel brightness setting process S5 is ended. When it judges that reprocessing is not performed, reprocessing of acquisition process S4 of a current-brightness property is performed.

[0035] Thus, in current-brightness property acquisition process S4, by setting up dot brightness amendment data according to the size, though the required current-brightness property of the range is made into the minimum count of brightness data acquisition, highly precise dot brightness amendment data are computable

[the brightness data of LED of each RGB of each pixel are compared with the average value of the brightness of each RGB for a current-brightness property, and].

[0036] Next, in the average luminance setting process S6, holding the condition that dot dispersion was amended in the dot brightness setting process S5, the average value of the brightness of each RGB is amended so that it may be in agreement with each predetermined value, and amendment of a result white balance is also attained. This amendment is performed by making the field brightness amendment data of the amendment data storage section 32 in the LED unit 1 set up and memorize.

[0037]

[Effect of the Invention] By the amendment approach of the image-display-device amendment system of this invention, and an image display device, image display devices, such as a white balance and field brightness amendment, can be amended efficiently.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the amendment approach of of the image-display-device amendment system and image display device with which the light emitting device of two or more color tones equipped the detail with the function which amends the amount of luminescence according to property dispersion of a light emitting device about the image display device arranged for every pixel.

[Translation done.]

PRIOR ART

[Description of the Prior Art] light emitting devices of high brightness, such as today and light emitting diode (LED), — RGB — it is each developed and a large-sized spontaneous light type full color display is produced. Especially, a LED display has the descriptions, like a light weight and thin-shape-izing are possible, and power consumption is low, and, also outdoors, need is increasing it rapidly as an usable large-sized display.
[0003] In the case of a large-sized LED display which is installed in the outdoors, it is constituted by generally combining two or more LED units, the image corresponding to the image field specified among the divided image fields is displayed on each LED unit, and all image fields are displayed on the whole LED display. The light emitting diode which makes RGB a lot on a substrate is arranged in the shape of a pixel matrix, and each LED unit performs the same actuation as an above-mentioned LED display to an LED unit. In a large-sized LED display with big size, a total of no less than 120,000 pixels LED beside [400] vertical 300x is used, for example.

[0004] Generally as a drive method of an LED unit, the dynamic drive method is used. For example, in the case of the LED display constituted in the shape of [of a m line n train] a matrix, the anode terminal of LED located in each line is connected common to one common source line, and the cathode terminal of LED located in each train is connected common to one current Rhine. Sequential ON of the common source line whose m lines are is carried out with a predetermined period, and a drive current is supplied to n ****** current Rhine according to the image data corresponding to turned-on Rhine. The drive current according to the image data is impressed to LED of each pixel by this, and an image is displayed.
[0005] In order to reproduce image data on a LED display correctly, it is needed that the optical output property (drive current-brightness property) of each LED is uniform. However, although LED is formed on a wafer of semiconductor technology, dispersion in an optical output property arises with a manufacture lot, a wafer, or a chip. For this reason, dispersion arose in a white balance or average luminance for every LED unit, and there was a problem that the discontinuity of an image was sensed for people's eyes in the boundary part of an LED unit. For this reason, a predetermined white balance and predetermined field brightness needed to be set up beforehand, the magnitude of the drive current corresponding to image data needed to be amended according to dispersion in the LED optical output property of each pixel of each LED unit, and the LED unit needed to be amended.
[0006] Then, amendment of the conventional image display device was performed as follows.
[0007] The monochrome luminescence display of each image data about a predetermined image, for example, RGB, and the white display by coincidence luminescence are read into an LED unit with brightness chromoscope, and it is set up so that a white balance and field brightness (average of brightness) may become a predetermined value. In brightness chromoscope, although the brightness and chromaticity as the field average of the whole LED unit are obtained correctly, it cannot obtain about the brightness in every pixel, and a chromaticity. Therefore, brightness dispersion for every pixel is amended by using photosensor and obtaining the relative luminance of each LED correctly for every pixel separately, next. According to this process, the LED unit by which a white balance, field brightness, and pixel brightness dispersion were amended can be obtained.

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EFFECT OF THE INVENTION

[Effect of the Invention] By the amendment approach of the image-display-device amendment system of this invention, and an image display device, image display devices, such as a white balance and field brightness amendment, can be amended efficiently.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, while amendment of the image display device by brightness chromoscope and photosensor could perform a white balance and field brightness amendment correctly, it had the trouble that amendment of an image display device took time amount. Then, this invention aims at offering the amendment approach of of the image-display-device amendment system and image display device which can amend image display devices, such as a white balance and field brightness amendment, efficiently, without causing the rise of production-line cost.

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MEANS

[Means for Solving the Problem] The display by which, as for the image-display-device amendment system of this invention, the light emitting device of two or more color tones has been arranged for every pixel, It is the image-display-device amendment system which amends the display of the image display device which consists of a mechanical component which supplies a drive current to said each light emitting device based on image data. The image reader with which said image-display-device amendment system has for brightness the two-dimensional photo detector which can be distinguished for every pixel at least to the whole surface of said display, It consists of image display compensators which supply predetermined image data to said image display device, and set up the drive current in said mechanical component. Further said image display compensator The image display device made into criteria is made to supply and drive said predetermined image data. The operation filter storage section which reads the brightness of the image read by the image reader for every pixel, and memorizes an operation filter with which each read brightness becomes a predetermined value, The brightness data storage section which the image display device which should be amended is made to supply and drive said predetermined image data, reads the brightness of the image read by the image reader through said operation filter, and memorizes the average value of the computed brightness, So that the average of the brightness of the image display device which should be amended based on the difference of the average of the brightness memorized in said brightness data storage section and said predetermined value may approach said predetermined value It considers as the configuration which has the brightness control section which sets up the drive current over each light emitting device supplied from said mechanical component for every color tone.

[0009] By this, the image-display-device amendment system which can amend image display devices, such as a white balance and field brightness amendment, efficiently can be offered.
[0010] The image-display-device amendment system of this invention furthermore, said brightness data storage section Further Said brightness data storage section memorizes further the brightness read through said operation filter for every light emitting device. Said brightness control section So that the brightness of each light emitting device in the image display device which should be amended may approach said predetermined value based on the difference of the brightness for every pixel memorized in said brightness data storage section, and said predetermined value By considering as the configuration which sets up the drive current over each light emitting device supplied from said mechanical component for every light emitting device, it can amend efficiently also about pixel brightness dispersion.
[0011] Moreover, the display by which, as for the amendment approach of the image display device of this invention, the light emitting device of two or more color tones has been arranged for every pixel, The display of the image display device which consists of a mechanical component which supplies a drive current to said each light emitting device based on image data It is the amendment approach of the image display device which amends brightness using the image reader which has the two-dimensional photo detector which can be distinguished for every pixel at least to the whole surface of said display. Make the image display device made into criteria supply and drive predetermined image data, and the brightness of the image read by the image reader is read for every light emitting device. The operation filter creation process which creates an operation filter with which each read brightness becomes a predetermined value, The average luminance reading process of making the image display device which should be amended supplying and driving said predetermined image data, reading the brightness of the image read by the image reader through an operation filter, and memorizing the average of the computed brightness, So that the average of the brightness of the image display device which should be amended based on the difference of the average of the brightness memorized in said brightness reading process and said predetermined value may approach said predetermined value It considers as the configuration which consists of an average luminance setting process of setting up the drive current over each light emitting device supplied from said mechanical component for every color tone.

[0012] By this, the amendment approach of the image display device which can amend image display devices, such as a white balance and field brightness amendment, efficiently can be offered.
[0013] Furthermore, the amendment approach of the image display device of this invention The dot brightness reading process of memorizing the brightness which read the amendment approach of said image display device through the operation filter for every light emitting device, So that the brightness of each light emitting device in the image display device which should be amended may approach said predetermined value based on the difference of the brightness for every light emitting device memorized in said dot brightness reading process, and said predetermined value By considering the dot brightness setting process of setting up the drive current over each light emitting device supplied from said mechanical component for every light emitting device as the configuration performed before said average luminance setting process Since it can amend efficiently also about pixel brightness dispersion and field brightness amendment is performed after amendment of pixel brightness dispersion, a white balance can be amended good.
[0014]
[Embodiment of the Invention] The schematic diagram of the image-display-device amendment system in this invention is shown in drawing 1 . 1 shows the LED unit which is an example of the image display device which displays the image corresponding to the image field specified among the divided image fields. The LED unit 1 is connected to the image display compensator 5. The image display compensator 5 displays a predetermined image on the LED unit 1, and reads the brightness of LED at that time with CCD camera 7 which is the image reader which has the two-dimensional photo detector which can distinguish brightness for every pixel [at least] to the whole surface of the LED unit 1. It is CCD camera 7 which is the image reader which has the two-dimensional photo detector which can distinguish brightness for every pixel [at least], and is because brightness can be measured for every light emitting device by making a light emitting device drive for every color tone by reading the image display of the LED unit 1. The light of the display image from the LED unit 1 is inputted into each CCD component through the visibility filter which is an optical filter attached in CCD camera 7. A visibility filter is attached in order to amend the gap with the sensibility property of a CCD camera and human being's visibility property in a light field. Furthermore, the image display compensator 5 compares the brightness data and the predetermined value about the brightness read by CCD camera 7, and amends the display of the LED unit 1 based on the comparison result.
[0015] The rough block diagram of the LED unit 1 is shown in drawing 2 . 11 is the display 11 which displays the image corresponding to the image field specified among the divided image fields. 1 pixel is constituted combining each LED of RGB corresponding to three color tones as a picture element (dot), two or more pixels are arranged in the shape of [of a m line n train] a matrix, and a display 11 is constituted.
[0016] The amendment data which need the amendment data storage section 32 for the brightness of a display 11 and amendment of a white balance are memorized. As the amendment data storage section 32, EEPROM is used, for example. The white balance amendment data and field brightness amendment data required for the amendment data storage section 32 in order to control the predetermined amount of currents supplied for every color tone in the current feed zone 14 which are data, and dot brightness amendment data required in order to amend brightness for every light emitting device in the brightness amendment section 13 are memorized. Amendment data are set up from the image display compensator 5 through the communications department 33.
[0017] The amendment data control section 31 writes amendment data required for amendment in the current feed zone 14 and the brightness amendment section 13, respectively. The inputted image data is inputted into the drive time amount control section 12 through the image input section 19 from the outside. The current of the amount of currents amended by the brightness amendment section 13 is supplied to the drive time amount control section 12, drive time amount is controlled by pulse width based on image data for the supplied current, and it inputs into a display 11 as a pulse drive current. At this time, the drive time amount control section 12 may be controlled not by pulse width but by the count of a drive of a fixed pulse etc.
[0018] The address-generation section 18 generates the address which shows the line corresponding to Vertical Synchronizing signal Vs and Horizontal Synchronizing signal Hs which were inputted, and inputs it into the common driver 17. The common driver 17 drives the line corresponding to the inputted address. Moreover, the drive time amount control section 12 serves as the segment driver, combines with the common driver 17, drives [the train corresponding to Horizontal Synchronizing signal Vs is driven, and] one pixel to time sharing, and realizes a matrix display.
[0019] Next, the brightness of a display 11 and amendment of a white balance are explained. In the current feed zone 14, the current supplied from the current feed zone 14 is amended for every RGB based on the white balance amendment data and field brightness amendment data which were memorized by the amendment data storage section 32. Thus, the white balance and field brightness of the LED unit 1 whole are amended, and

dispersion for every LED unit is prevented.
[0020] In the brightness amendment section 13, the drive current supplied to each LED is amended for every LED child based on the dot brightness amendment data memorized by the amendment data storage section 32 for every light emitting device. Thus, the brightness of each LED is adjusted and dispersion in the brightness for every light emitting device in the same LED unit 1 is prevented.
[0021] Therefore, it becomes possible to prevent dispersion not only in the brightness for every LED unit, and dispersion of a white balance but the brightness for every pixel in the same LED unit.
[0022] moreover, the brightness amendment section 13 after the drive current first supplied to each LED corresponding to the color tone of each RGB based on white balance amendment data and field brightness amendment data was amended in the current feed zone 14 — setting — each of each pixel — amendment becomes possible by amending a drive current according to an individual for each [, such as white balance amendment, field brightness amendment, and dot brightness amendment,] element of every.
[0023] Next, the schematic diagram of the image display compensator 5 is shown in drawing 3 . The electrical signal about the brightness read by CCD camera 7 is changed into the digital signal of 0-255 in the brightness input section 52. In an operation filter creation process, the changed digital signal creates an operation filter with which each brightness read in the CCD proofreading section 53 becomes a predetermined value, and memorizes it in the operation filter storage section in the CCD proofreading section 53. Moreover, in a dot brightness reading process and an average luminance reading process, the CCD proofreading section 53 amends the changed digital signal using an operation filter, and inputs the amended brightness data into the brightness control section 51. The brightness control section 51 computes the average value of brightness data to the inputted brightness data, and makes the brightness data storage section 54 memorize the average value of brightness data and the brightness data for every light emitting device which were computed.
[0024] furthermore, the thing for which the field brightness amendment data in the amendment data storage section 32 of the LED unit 1 are set up for every color tone through the communications department 56 in the brightness control section 51 based on the difference of the average of brightness data and the predetermined value which were memorized in the brightness data storage section so that the average of brightness may approach a predetermined value — a drive current is controlled. Control of a drive current is controllable by the amount of currents or drive time amount to supply. moreover, the thing for which the brightness control section 51 sets up the dot brightness amendment data in the amendment data storage section 32 of the LED unit 1 for every pixel of each LED through the communications department 56 based on the difference of the brightness data for every LED memorized in the brightness data storage section, and said predetermined value so that the brightness of each LED may approach a predetermined value — a drive current is controlled. The predetermined image data supplied to the LED unit 1 is outputted to the LED unit 1 through the image output section 55.
[0025] In this invention, dispersion of the orientation property of an LED proper and sensibility dispersion of the CCD component 72 can be amended by creating an operation filter based on a criteria unit in an operation filter creation process. Thus, by creating an operation filter and reading image data, a highly precise current-brightness property is acquirable.
[0026] The display amendment approach of the LED unit 1 is explained below.
[0027] First, a criteria LED unit required for proofreading of CCD camera 7 is created. Through the image input section 19, the image data about a predetermined image is inputted into a criteria LED unit, the display image is read into it with brightness chromoscope, and white balance amendment data and field brightness amendment data are set up by the amendment data storage section 32, respectively, and are remembered that a white balance and field brightness become a predetermined value. In this brightness chromoscope, although the brightness and white balance to the whole surface of the LED unit 1 can measure correctly, it cannot measure about the brightness about each LED. Then, the relative luminance of each LED is correctly measured using photosensor. And it makes it set up and remember that the dot brightness amendment data of the amendment data storage section 32 in the LED unit 1 amend dispersion in the brightness of each pixel, and the criteria LED unit by which a white balance, field brightness, and dot brightness dispersion were amended correctly is obtained.
[0028] As image data about a predetermined image, all LED drive displays for every RGB by the maximum of the image data of each RGB and all white displays [LED drive] by the maximum of the image data of RGB are mentioned, for example. The drive current supplied to each RGB so that it may become a predetermined color temperature and the predetermined field average luminance corresponding to the maximum of the image data of RGB about these images is set up.
[0029] Next, based on the criteria unit correctly adjusted using brightness chromoscope and photosensor, LED unit display amendment processing in which display amendment of each LED unit is performed is explained

using the flow chart of drawing 4 .

[0030] At the criteria unit reading process S1, a criteria unit is arranged so that the display image can be read with CCD camera 7, and it connects with the image display compensator 5. And the image display compensator 5 inputs the image data about a predetermined image into a criteria unit through the image input section 19, and the brightness data which correspond for every LED in the condition that the setup of an operation filter is not made by the CCD proofreading section 53 are read through CCD camera 7. And in the operation filter creation process S2, the image display compensator 5 creates an operation filter so that it may become the predetermined value with which the image data of each read LED is regarded as a criteria white balance and datum-level brightness having been set up, and it sets it as the CCD proofreading section 53. As a predetermined value, the average of each brightness corresponding to all LED drive displays for every RGB by the maximum of the image data of each RGB is mentioned, for example. Correction by sensitiveness of CCD camera 7 to the display light from an LED unit is performed by this processing. Sensibility dispersion of each CCD camera 7 can be performed using a common criteria unit at the time of the mass production of an LED unit which installs two or more CCD cameras 7, and performs display amendment of the LED unit 1 especially, and display dispersion of the LED unit 1 resulting from sensibility dispersion of CCD camera 7 can be prevented.

[0031] Next, in the LED unit brightness reading process S3, the LED unit 1 to which amendment of a white balance and field brightness is not performed is arranged so that the display image can be read with CCD camera 7, and it connects with the image display compensator 5. Like the criteria unit reading process S1, the image display compensator 5 inputs the image data about a predetermined image into the LED unit 1 through the image input section 19, and reads and memorizes the brightness data amended by the CCD proofreading section 53 in the condition that CCD camera 7 and the operation filter were set up for every LED. The average of the brightness about the whole LED unit of the read brightness data corresponding to it and coincidence is computed and memorized for every LED. The LED unit brightness reading process S3 includes the pixel brightness reading process of reading and memorizing this brightness data for every LED, and the average luminance reading process which computes the average of the brightness about the whole LED unit, and is memorized.

[0032] Next, in current-brightness property acquisition process S4, the drive current supplied to each LED is changed by setting up the dot brightness amendment data of the amendment data storage section 31 of the LED unit 1 interior, and the current-brightness property of each LED is acquired.

[0033] Here, the processing in current-brightness property acquisition process S4 is explained using the flow chart of drawing 5 . First, in step S41, LED of each pixel is all displayed for every RGB, each brightness data is read for every LED, and the average of the brightness of the LED unit 1 whole is computed for every RGB. Next, in step S42, the brightness data of LED of each RGB of each pixel are compared with the average value of the brightness of each RGB, when the brightness data of LED are larger, it shifts to step S43, and when the brightness data of LED are smaller, it shifts to step S44. In step S43, the minimum value of dot brightness amendment data is set up and memorized by the amendment data storage section 32 in the LED unit 1. Moreover, the maximum of dot brightness amendment data is set up and memorized in step S44 by the amendment data storage section 32 in the LED unit 1. Next, in step S45, it judges whether the comparison with the image data of LED and the average of brightness was performed about all pixels and RGB, when all are performed, processing S4 is ended, and when all are not performed, return and the same processing are performed to step S42 about other pixels and other color tones.

[0034] Next, in the pixel brightness setting process S5, in step S51, a predetermined image is first displayed based on the dot brightness amendment data with which the LED unit 1 was set as the amendment data storage section 32, and the brightness data of each pixel are acquired for every RGB. Next, the dot brightness amendment data which computed dot brightness amendment data based on the difference of the brightness data for every RGB of each pixel and the average value of the brightness of each RGB which were acquired in step S51 so that the brightness data of LED of each RGB of each pixel might become the average value of the brightness of each RGB, and were computed in the amendment data storage section 32 in the LED unit 1 are made to set up and memorize in step S52. Next, in step S53, a predetermined image is displayed based on the dot brightness amendment data with which the LED unit 1 was set as the amendment data storage section 32, and the brightness data of each LED are acquired for every RGB. Next, in step S54, the difference of the brightness data of LED of each RGB of each pixel and the average of the brightness of each RGB is computed, and the difference of each RGB of all pixels judges whether it is the inside of tolerance. When all those differences judge it as the inside of tolerance, the pixel brightness setting process S5 is ended. When it judges that all those differences are not in tolerance, it shifts to step S55. In step S55, it judges whether reprocessing of processing of current-brightness property acquisition process S4 was performed. When it judges that

reprocessing was performed, it shifts to step S56, abnormalities are displayed, and the pixel brightness setting process S5 is ended. When it judges that reprocessing is not performed, reprocessing of acquisition process S4 of a current-brightness property is performed.

[0035] Thus, in current-brightness property acquisition process S4, by setting up dot brightness amendment data according to the size, though the required current-brightness property of the range is made into the minimum count of brightness data acquisition, highly precise dot brightness amendment data are computable [the brightness data of LED of each RGB of each pixel are compared with the average value of the brightness of each RGB for a current-brightness property, and].

[0036] Next, in the average luminance setting process S6, holding the condition that dot dispersion was amended in the dot brightness setting process S5, the average value of the brightness of each RGB is amended so that it may be in agreement with each predetermined value, and amendment of a result white balance is also attained. This amendment is performed by making the field brightness amendment data of the amendment data storage section 32 in the LED unit 1 set up and memorize.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram of the image-display-device amendment system in this invention.
[Drawing 2] It is the schematic diagram of the LED unit which is the example of the image display device in this invention.
[Drawing 3] It is the schematic diagram of the image display compensator in this invention.
[Drawing 4] It is a flow chart about the LED unit display amendment processing in this invention.
[Drawing 5] It is a flow chart about the current-brightness property acquisition process in this invention.
[Drawing 6] It is a flow chart about the dot brightness setting process in this invention.
[Description of Notations]
1 ... LED unit
11 ... Display
12 ... Drive time amount control section
13 ... Brightness amendment section
14 ... Current feed zone
17 ... Common driver
18 ... Address-generation section
19 ... Image input section
31 ... Amendment data control section
32 ... Amendment data storage section
33 ... Communications department
5 ... Image display compensator
51 ... Brightness control section
52 ... Brightness input section
53 ... CCD proofreading section
54 ... Brightness data storage section
55 ... Image output section
56 ... Communications department
7 ... CCD camera

[Translation done.]

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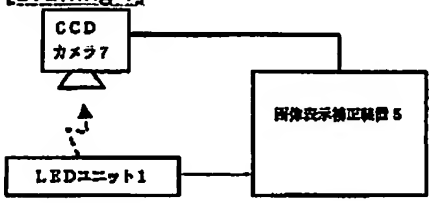
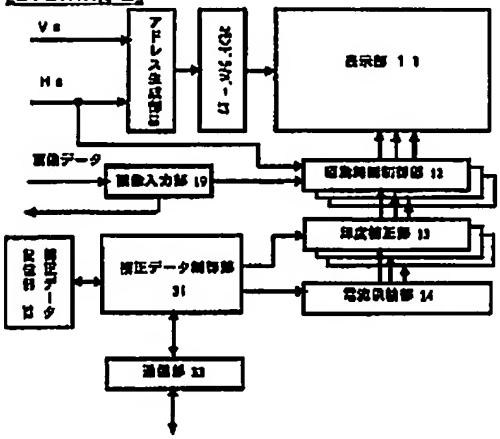
DRAWINGS

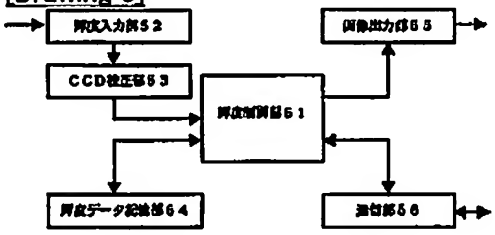
[Drawing 1]



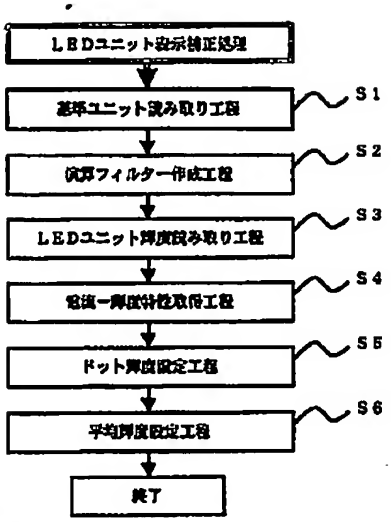
[Drawing 2]



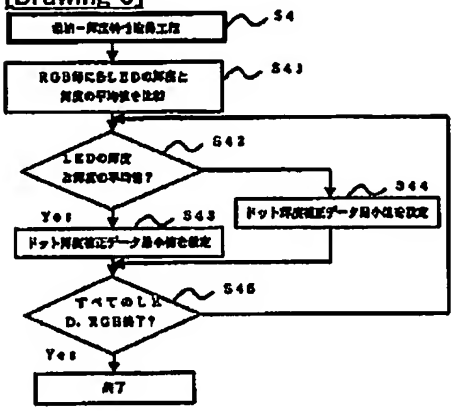
[Drawing 3]



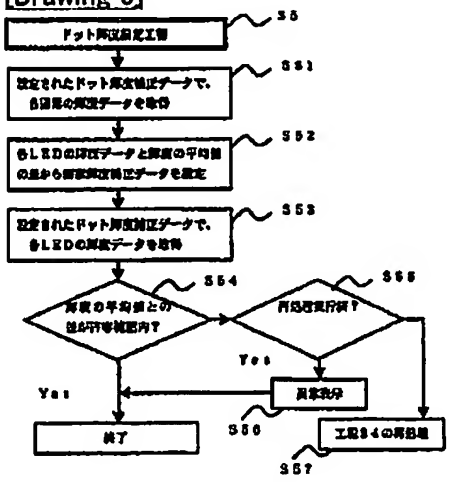
[Drawing 4]



[Drawing 5]



[Drawing 6]



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